Resource Disclosure
South American Context

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Introduction

• Discussion of resource definitions focusing on interpretive aspects
• Application of resource definitions to South American plays
• Provide guidelines for review of disclosure by Oil and Gas Issuers
Key Concepts

Known Accumulation

• At least one well penetration

• Testing, sampling and/or logging must confirm presence of significant moveable hydrocarbon

• If not tested, there must be a good analog

• May be assigned reserves or contingent resources
Key Concepts

Project Based System

• The project represents the link between the petroleum accumulation and the decision-making process

• A technically viable development project must be defined in order to assign any class of recoverable resources
Implications of Key Concepts

Prospective Resources

• Project is defined by the exploration well and the conceptual development plan

• Conceptual development plans are generally based on suitable analogs

• Without project definition, resources are classified as unrecoverable
Implications of Key Concepts

Contingent Resources

• Timing of development
• Market
• Production and transportation facilities
• Government/Legal/Environmental Approval
• Commitment to proceed (Budget, AFEs)
• Financing
Uncertainty
Range of Possible Outcomes

Low Estimate Category
• 25% Filled

Best Estimate Category
• Midway between Low and High

High Estimate Category
• Total Mapped Reservoir to Spill Point

Fault

Structure Contour at Spill Point
Llanos Basin Prospect

Fault

C5

C7

Mirador

Gacheta

Une
## Common Prospective Resource Disclosure

<table>
<thead>
<tr>
<th>Exploration Prospect</th>
<th>Unrisked Prospective Resources (MMbbl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>20</td>
</tr>
</tbody>
</table>
Resource Disclosure

Misleading Aspects

• The sum of unrisked resources is misleading.

• For example, if the chance of success of each prospect A, B and C is 20%, there is only a 0.8% chance of achieving the best estimate total.

• Prospects in the Llanos Basin are generally multi-layer reservoirs.

• It is common practice to arithmetically add the unrisked resources assigned to each layer.
### Prospect A With Three Layers

<table>
<thead>
<tr>
<th>Layer</th>
<th>Unrisked Best Estimate</th>
<th>Pg</th>
<th>Risked Best Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>C7</td>
<td>2000</td>
<td>25%</td>
<td>500</td>
</tr>
<tr>
<td>Mirador</td>
<td>3000</td>
<td>20%</td>
<td>600</td>
</tr>
<tr>
<td>Une</td>
<td>5000</td>
<td>10%</td>
<td>500</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1600</td>
</tr>
</tbody>
</table>
Prospect A

Chance of at least one layer being successful:

\[ = 1 - (1-0.25) \times (1-0.20) \times (1-0.10) \]

\[ = 46\% \]

De-risked Prospective Resources:

\[ = \frac{1600}{0.46} \]

\[ = 3478 \text{ Mbbl} \]
## Resource Disclosure

### Prospect A With Three Layers

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<tr>
<th>Layer</th>
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<td>5000</td>
<td>10%</td>
<td>500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3478</strong></td>
<td><strong>46%</strong></td>
<td><strong>1600</strong></td>
</tr>
</tbody>
</table>
Valuation of Prospective Resources

Prospect A

Risked Best Estimate Prospective Resources = 1600 Mbbl
Risked 10% Net Present Value ($40/bbl) = 64.0 MM$
Dry Hole Cost (Unrisked/Risked) = 8.0/4.3 MM$
Expected Net Present Value of Prospect A = 59.7 MM$
Argentina - Vaca Muerta Shale Play

- Vaca Muerta is present in an area of 30,000 Km² (7.4 million acres)
- Of this area, YPF participates in 12,000 Km² (3.0 million acres - 40% of the total)
  - 9,311 km² oil
  - 670 km² wet gas
  - 2,019 km² dry gas

Source: YPF
Repsol YPF Developed Areas

VERTICAL WELLS IN PRODUCTION

- 17 vertical wells on production with 3 to 4 fracs per well

The wells were drilled in the Loma de la Lata, Loma Campana and Bajada de Añelo Blocks

- Initial choked vertical well rates range between 200 and 600 bopd

Initial well rates; The wells are restricted by 4mm chokes

Source: YPF
• Gross contingent resources = 1.5 Bboe
  ▪ Area = 1,100 km²
• Gross prospective resources = 21.2 Bboe
  ▪ Area = 8,071 km²

Repsol did not disclose the resource category for the above (Low, Best or High)
Caution for Investors

• Tendency to assume that shale deposits are homogeneous and to extrapolate information over large areas for contingent resources.

• The resources quoted by Resource Issuers for shale resources are usually unrisked. It would be appropriate to assume higher risk as the distance away from tested areas increases.
South America - Other Shale Plays

US Energy Information Administration
Technically recoverable shale gas resources = 1225 Tcf
No estimate yet for liquids
Shale Deposits Outside the Neuquen Basin

• It is appropriate to calculate undiscovered petroleum initially in place where well control and seismic are available.

• Untested basins should not be assigned prospective resources until an appropriate analog and development project can be identified.
Summary

• Contingent resources - known accumulations.
• Prospective resources - undiscovered accumulations.
• Reasonable technically viable development project.
• Addition of unrisked contingent or prospective resources for multiple entities is misleading.
• Appropriate treatment of risk and aggregation of multi-layer and multi-prospect inventories.
• Use of appropriate analogs.